

# **PALLET**

## **FIELD OF THE INVENTION**

The present invention relates to a pallet, especially to a pallet with the function of support and position limitation.

## **BACKGROUND OF THE INVENTION**

A pallet of the prior art utilizes different position-limiting devices according to different cargoes to ensure correct position limitation and safety in transportation. With the rapid development of logistics, for the transportation of the valuable cargoes having definite cargo-structure holes such as automobile parts, machining parts, etc., higher demands have been put on both their position limitation in transportation and the efficiency of position limitation for cargo loading. How to efficiently prevent the cargo from damage caused by movement during transportation and to improve the efficiency of position limitation for cargo loading as well as to further ensure the cargo transportation safety has become a pressing problem.

## **SUMMARY OF THE INVENTION**

The objective of the present invention is to provide a pallet which can ensure the cargo transportation safety through arranging reliably positionale support position-limiting assembly, improve the position limiting efficiency of cargo loading by using connecting tubes, and prevent cargoes from damages while realizing rapid cargo loading through

arranging guiding surfaces and installing dunnage, ensuring further the cargo transportation safety.

The objective of the present invention is solved by providing a pallet, including a base frame, and four independent posts, wherein it further includes at least one support position-limiting assembly arranged at a predetermined position on the base frame, the support position-limiting assembly includes:

a bending component, having a supporting surface and two opposite position-limiting surface bended and extending along two opposite edges of the supporting surface, at least a group of position-limiting holes being arranged in opposition at the predetermined positions on the two opposite position-limiting surface, and

positioning and connecting components fitted with the position-limiting holes.

The above-mentioned pallet, wherein the support position-limiting assembly further includes at least a connecting tube, the ports of the two ends of each connecting tube being connected accordingly with each group of position-limiting holes.

The above-mentioned pallet, wherein the positioning and connecting component is a bolt or a pin-connected component.

The above-mentioned pallet, wherein the pin-connected component includes:

a locking pin;

a latch, which has one annular end and a matching hole with a diameter matched with the locking pin for locking the locking pin arranged near the other end.

The above-mentioned pallet, wherein the pin-connected component further includes:

two chains, one end of each chain is respectively connected with the annular end of the latch and the locking pin;

binding ring, located on the base frame and connecting to the other end of each chain.

The above-mentioned pallet, wherein a multiplicity of the support position-limiting assemblies are arranged in two lines and near the same side of the base frame of the pallet.

The above-mentioned pallet, wherein there are two binding rings arranged at two sides of a side beam of the base frame on which the support position-limiting assembly is located.

The above-mentioned pallet, wherein a transverse beam is arranged between the posts of the pallet to form an end frame or a side frame structure together with the posts.

The above-mentioned pallet, wherein the support position-limiting assembly further includes a multiplicity of supporting seats arranged at the predetermined positions on the base frame.

The above-mentioned pallet, wherein a guiding surface is extended upward obliquely along one edge which is located between the two position-limiting surfaces and on the supporting surface.

The above-mentioned pallet, wherein the position-limiting hole can be a circular one, an elliptical one or a polygonal one.

The above-mentioned pallet, wherein the connecting tube can be a circular one, a semi-circular one or a U-shaped one.

The above-mentioned pallet, wherein at least one group of installation holes for fixing the dunnage on the supporting surface are further arranged in opposition on the two position-limiting surfaces.

The present invention will now be described in details with attached drawings and preferred embodiments which, however, won't be used as a limitation to the present invention.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

These and other objects of the invention will be apparent from the following detailed description of the embodiments of the present invention with reference to the accompanying drawings, in which

Fig.1 is a schematic drawing showing the structure of a preferred embodiment of a pallet according to the invention;

Fig.2 is a schematic drawing showing the structure of another preferred embodiment of a pallet according to the invention;

Fig.3 is a schematic drawing showing the support position-limiting assembly in its working condition according to the invention in Fig.2;

Fig.4 is a schematic drawing showing the positioning connecting components of the support position-limiting assembly in two different working conditions according to the invention;

Fig.5 is a schematic drawing showing the structure of the support position-limiting assembly according to the invention;

Fig.6 is a schematic drawing showing the structure of the U-shaped bending components of the support position-limiting assembly according to the invention in Fig. 5;

Fig.7A is a schematic drawing showing the condition when the latch and the chain of the positioning and connecting components according to the invention are connected with each other;

Figs.7B is a schematic drawing showing the structure of the latch in Fig.7A;

Fig.8A is a schematic drawing showing the condition when the locking pin and the chain of the positioning and connecting components according to the invention are connected with each other;

Fig.8B is a schematic drawing showing the structure of the locking pin in Fig.8A

Fig.9A is a schematic drawing showing the structure of a cargo of the pallet according to the invention;

Fig.9B is a schematic drawing showing the structure of a cargo using the support position-limiting assembly according to the invention to realize position limitation.

## **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings.

Fig.1 shows the structure of a preferred embodiment of pallet according to the invention, which includes a base frame 10, four independent posts 20, and one or more support position-limiting assemblies 30 arranged at the predetermined positions on the base frame 10. Or, as is shown in Fig.2, a transverse beam 22 is further arranged between

the posts 20, forming a side frame (not mark in the Fig.2) or an end frame structure.

Figs.5~8B show the structure of the support position-limiting assembly 30 according to the invention. As is shown in Fig.5, the support position-limiting assembly 30 includes a bending component 31 (such as a U-shaped one), a connecting tube 33, and a positioning and connecting component 34 (as is shown in Fig.3) The bending component 31 has a supporting surface 311, two position-limiting surfaces 312 which bend toward the same side along two opposite edges of the supporting surface 311 and extend to a certain height (in general, the position-limiting surfaces 312 are arranged vertical to the supporting surface 311) and in which a group or groups of position-limiting holes 3121 are provided according to the requirements on positioning and connection, as is shown in Fig.6. In addition, as is shown in Fig.6, a multiplicity of corresponding installation holes 3123 can be arranged in the two position-limiting surface 312, with which dunnage can be fixed on the supporting surface and the surface of the cargo can be prevented from damage during the loading or transportation. The connecting tube 33 has the function of guidance for a smooth guide and rapid connection of the positioning and connecting components 34. Furthermore, the connecting tube 33 has different shapes like circular tube, semi-circular tube, U-shaped bending component or parts of any other materials/shapes, in which the ports of the two ends of the connecting tube 33 are connected with the position-limiting holes 3121 respectively to ensure a smooth guide of a positioning and connecting component 34. In the present invention, the position-limiting holes 3121 used in conjunction with the connecting tube 33 can have different shapes such as a circular one, an elliptical one, a rectangular one or a polygonal one which, however, must meet the

requirement on the connection with the connecting tube.

In the present invention, the positioning of the connecting tube 33 can be realized through bolt connection, pin connection or any other effective ways. To ensure a reliable positioning and an effective and easy operation of the guiding and positioning devices (the connecting tube 33 and the positioning and connecting component 34), pin-connected component including the latch 341, the locking pin 342, the chain 343, and the binding ring 344 is usually used as the positioning and connecting component 34 which is used in conjunction with the connecting tube 33. Figs.7A, 7B, 8A, and 8B show the structures of the latch 341, the locking pin 342, and the chain 343, respectively. With regard to Figs.3 and 4, the latch 341 is arranged at one side where the fixation of cargoes is easy to perform and has an annular end of ring shape 3411 connected with a chain 343, a matching hole 3412 for locking the locking pin with a diameter matched with the locking pin 342 is arranged on the other end of the latch 341, the latch 341 being able to be effectively prevented from sliding out from the position-limiting hole 3121 through locking the locking pin. The locking pin 342 is arranged at the through side of the latch 341, corresponding to the position of the latch 341, while the locking pin 342 is connected to one end of the other chain 343 which is fixed by the binding rings 344 located at the two sides of the beam where the support position-limiting assembly 30 on the base frame 10 is located to prevent the position-limiting component (the latch 341) and the locking component (locking pin 342) from being lost. In addition, the locking pin 342 and the latch 341 can be arranged at the same side of the support position-limiting assembly, or they can be arranged at two sides as shown in the figure. When loading cargoes on the

pallet, the latch 341 can be inserted rapidly into the cargo structure hole and then goes through the position-limiting hole 3121 and the connecting tube 33, the locking pin 342 can be inserted into the matching hole 3412 for locking the locking pin after the latch 341 goes out to realize a reliable positioning of the latch 341. Also in void load, the latch 341 can be inserted into the connecting tube 33 and be locked by the locking pin 342 to realize a reliable keeping of the connecting accessories for void load. As is shown in Fig.4, the support position-limiting assembly in the left part of the dotted line shows the operation condition for cargo transportation/void load storage, while the right part shows an open condition.

In the present invention, the form of the support position-limiting assembly won't be limited and can be changed flexibly with the size of cargoes' shapes and structure, e.g., the support position-limiting assembly can be arranged to have one or more groups according to the loading requirements and can be distributed across the base frame. As is shown in Figs.1 or 2, the pallet according to the invention can be used specially for transporting automobile parts or other machining parts such as turbine housing, etc., and two lines of support position-limiting assembly groups, which are disposed forward and backward at one side of the pallet, are arranged on the side beam of the base frame 10, each group having two support position-limiting assembly 30. In addition, a binding ring 344 is arranged at each side of the side beam for binding and fixing the chain 343 with the latch 341 and the locking pin 342. Furthermore, a supporting seat 40 can be arranged at the predetermined position on the base frame 10 for corresponding support according to different cargoes, realizing a common support to the cargoes together with the support

position-limiting assembly 30. In addition, as is shown in Fig.5, an inclined guiding surface 35 can be extended upward along one side edge of the supporting surface 311 for a smooth guiding in loading the cargoes as well as for support and position limitation. Thus in loading, cargoes can be supported by the supporting seat 40, while the loading can be smoothly guided by the guiding surface 35 to easily guide the cargoes into the support position-limiting assembly 30, and the cargoes' position can be limited rapidly by the connecting tube 33 of the support position-limiting assembly 30.

Figs.9A and 9B show the structure of a cargo 90 of the pallet according to the invention and the structure of the cargo by using the support position-limiting assembly 30 according to the invention to realize position limitation. The figures show only a schematic cargo which won't be limited to the shown type in practical application. It is more important that the cargo has an installation hole 92 and an installation surface 91 are arranged matched with the support position-limiting assembly 30, i.e., the cargo is required to have only a structure fitted with the profile of the support position-limiting assembly 30 and the corresponding installation holes.

Therefore, in using the support position-limiting assembly 30 for positioning, first the cargo 90 is guided along the guiding surface 35 and gets in contact with the supporting surface 311 of the support position-limiting assembly 30 to carry the cargo, the installation hole 92 in the cargo is then centered with the position-limiting hole 3121, and the latch 341 goes through, and the holed end of the latch 341 is locked and positioned by the locking pin 342 when it goes out of the connecting tube 33.

Thus, through the arrangement of the connecting tube 33, the efficiency of the

position limitation is greatly enhanced, and the cargoes can be loaded rapidly and be prevented from damages by using the guiding surface and dunnage, etc., ensuring thus the safety in cargo transportation through the positioning and position-limiting functions of the support position-limiting assembly 30 according to the invention.

### **Industrial applications**

By means of the support position-limiting assemblies, it is possible to realize a rapid and reliable positioning, ensuring thus a safe transportation of loaded cargoes.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.